KNOWLEDGE EXPECTATIONS FOR PEST CONTROL ADVISORS:
WEED CONTROL

I. WEED ID

Recognize the major plant characteristics used to identify weeds.

Define and locate:
- seed pappus;
- cotyledons;
- first true leaf;
- collar;
- leaf blade;
- node;
- internode;
- leaf sheath;
- petiole;
- auricle;
- ligule;
- awn;
- hypocotyl;
- epicotyl;
- calyx;
- inflorescence;
- axil;
- culm;
- tiller;
- coleoptile;
- tuber;
- rhizome;
- stolon.

Recognize the key features used to identify:
- grass seedlings;
- broadleaf seedlings.

Identify 50 common weed species or genera in mature stages of development by common name (list attached).

Identify 25 common broadleaf weed species or genera in seedling stage by common name (list attached).

Classify the 50 common weed species on the attached list:
- annual (summer or winter);
- perennial;
- biennial;
- dicot;
- monocot.

Recognize that the following weeds are poisonous:
- common cocklebur;
- jimsonweed;
- nightshades;
- common groundsel;
- coast fiddleneck;
- yellow starthistle.

Identify types of vegetative propagules.

Recognize unique seed or vegetative growth structures that plants have which aid in dispersal and provide examples of weeds which have them:
- plants with burs or spiked seeds that catch in animal fur (cocklebur, filaree, puncturevine, wild oat, foxtail barley, hare barley);
- plants that disperse their seed with tumbling plant parts (Russian thistle, witchgrass);
- plants with seed that are pappus-bearing for dispersal by wind (hairy fleabane, common groundsel, cattails);
- plants which spread with vegetative propagules (Johnsongrass, yellow nutsedge, field bindweed);
- plants that produce prolific small seed (purslane, barnyardgrass, dallisgrass, pigweed, smallflower umbrella sedge).

List information that should be taken when collecting weed samples.

Describe how to take and prepare a weed sample to assure correct identification.

List resources to assist in weed identification.

II. WEED BIOLOGY

Describe the function of the following plant parts:
- xylem (apoplast);
- phloem (symplast);
- chloroplast;
- membranes;

endodermis;
epidermis;
Casparian strip;
cuticle;
apical meristem;
root hairs;
root meristem;
mitochondria;
stomata.

A. Germination requirements

Describe the conditions necessary for weed seeds to germinate.

Compare and contrast how differing weed germination requirements affect management decisions.

Define seed dormancy.

Differentiate between primary and secondary dormancy.

Describe some factors that regulate or break seed dormancy:
scarification;
chemical inhibition;
temperature.

Describe the impact of seed depth on germination.

Describe the effect of seed size on dormancy and the depth from which a weed seed can successfully germinate.

B. Growth habits

Define:
annual;
perennial;
biennial;
dicot;
monocot;
summer annual;
winter annual.

C. Growth rates/competition

Describe the influence of;

day length on flowering;
crop density on weed growth;
temperature on plant growth;
temperature on weed spectrum;
water availability on plant growth.

Recognize the importance of light in plant growth and development.

D. Reproduction

Describe the reproductive capability of weeds.

Describe the mechanisms by which weed seeds are disseminated.

Describe how the following factors contribute to regulating the seed bank and seed longevity:
biotic factors of the environment, such as natural decay;
loss of seed viability;
production practices, such as applications of preemergent herbicides;
cultural practices.

Describe how different types of vegetative propagules spread.

E. Biotypes

Define:
biotype;
ecotype.

Describe the impact of weed biotypes/ecotypes on management practices.

III. WEED MANAGEMENT

A. Using sampling and recordkeeping in weed management decisions

Describe how to map a field in relationship to weed management considerations.

List information necessary to document a field's weed history.

Identify methods and patterns for sampling weeds (IPM in Practice chapter 6);
absolute vs. relative sampling;
random , systematic and stratified sampling patterns.

Identify essential times during which monitoring should be done.

B. Biological Control Methods

Define biological control.

Describe examples of biological weed control.

Describe the role of the county agricultural commissioner in biological control of weeds.

Describe and give an example of biological weed control using:
- arthropods;
- pathogens;
- grazing animals.

Identify the factors that would limit the use of biological control for weeds.

C. Crop Culture

Describe the impact of the following practices on weeds:
- seedbed preparation;
- irrigation method;
- irrigation timing;
- time of seeding;
- soil nutrition;
- crop variety;
- crop rotation;
- pre-irrigation;
- soil (dust) mulch;
- plastic or fabric mulches;
- organic mulches;
- sanitation methods.

D. Mechanical/Physical Controls

List and describe common cultivation/tillage methods.

Describe how weed species are affected by:
- depth of tillage;
- timing of tillage.

Describe cultivation techniques used in perennial crops.

Explain the difference between primary and secondary tillage.

Compare and contrast the advantages/disadvantages of different cultivation methods.

Identify the proper timing for cultivation and hand weeding.

Describe the use of the following methods for weed control:

burning;
flaming;
solarization.

Describe how control measures using heat affect the plant

Describe some preventative measures that can be used to manage weeds (certified seed, quarantines, clean equipment).

E. Chemical Control Methods

List the various methods used to classify herbicides.

Define mode of action and the results of using an herbicide with a given mode of action.

List the mode of action for the following herbicide types and recognize these common herbicides:

amides (propanil);
bipyridiliums (paraquat, diquat);
dinitroanilines (trifluralin);
diphenylethers (oxyfluorfen);
glycine (glyphosate);
phenoxy carboxylic acids (auxinic herbicides, 2,4-D);
phosphinic acid (glufosinate);
sulfonylureas (chlorsulfuron);
thiocarbamates (EPTC, thiobencarb);
triazines (atrazine, simazine);
ureas (linuron, diron).

Define:

phytotoxicity;
preemergent herbicide;
pre-plant incorporated herbicide;
post-emergent herbicide;
adjuvant;
herbicide resistance;
cross-resistance;
soil persistence;
plantback restrictions.

Describe factors which can cause herbicide symptoms on a crop and how to diagnose what caused them.

Describe foliar versus soil application methods for herbicides.

Describe how the following factors affect preemergent and pre-plant soil incorporated herbicide activity:
- incorporation depth;
- rate;
- soil;
- irrigation type;
- irrigation amount.

Describe how the following factors affect postemergent herbicide activity:
- plant size;
- plant growth stage;
- temperature;
- moisture;
- time of day;
- rainfall;
- overhead irrigation.

Describe mechanisms of herbicide selectivity.

Describe ways:
- herbicides are taken into the plant;
- some herbicides move within the plant.

List the common formulations of herbicides and their properties.

List reasons for adding an adjuvant to an herbicide formulation.

Describe how soil microbes may enhance degradation of herbicides.

Describe how knowledge of herbicide mode of action aids in resistance management.

Differentiate between herbicide tolerance and herbicide resistance in weeds.

Describe methods used to manage herbicide resistance.

Describe the importance of crop rotation in managing herbicide resistance.

Describe how the following conditions increase persistence/availability of most herbicides in the soil:
- cool weather;
- dry soil;

low organic matter.

Describe how the following factors affect herbicide activity and movement in the soil:
herbicide solubility;
soil texture;
organic matter.

Describe the differences in spray pattern/placement between aerial and ground applications of herbicides.

Describe how the following factors influence the effectiveness of a herbicide application:
timing in relation to plant growth;
temperature;
moisture;
wind;
soil type;
plant vigor.

Describe methods to manage drift.

Define the following chemical application methods:
Identify situations in which they would be used:
chemigation;
wick/wiper;
incorporation;
banded;
broadcast;
directed;
shielded;
lay-by.

Describe how to calibrate a sprayer.

F. Economic Evaluation of Weed Management Actions

List the economic factors to be considered in a weed control program.

Describe how the cost of weed control can be compared with the benefit of control.

G. Environmental Considerations

Identify the factors that contribute to herbicide leaching to groundwater.

List factors that affect the behavior of herbicides in the soil and the environment.

Describe the impact, of the following factors on drift:

- weather (wind, fog, temperature);
- temperature inversion;
- droplet size.

H. Integrated Weed Management

Define integrated weed management.

Describe how the following practices can be used in integrated weed management:

- field selection;
- cropping sequence;
- use of cover crops and green manures;
- land and seedbed preparation;
- irrigation and fertilization management;
- sanitation;
- weed id;
- insect and disease control;
- herbicide selection.

Describe the benefits of an integrated weed management approach.